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Mathematics Camp Model for Primary School

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Abstract

A series of Mathematics Camps were organized as an effort to improve pupils' achievement in Mathematics. This article introduces a model used in a series of twelve Mathematics Camps for primary school since 2008. This article also shares the research findings obtained during the Camps. The explanatory design of mixed method was used in the study. Census was used in collecting quantitative data where randomly selected participants, teachers and parents were involved in the interview. Overall, participants, teachers and parents were satisfied with the Mathematics Camp. Participants also showed interest, enthusiasm, motivation and positive attitude towards Mathematics after the Camp.

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Keywords: Model; Mathematics Camp; Primary school

1. Introduction

Mathematics was identified as one of the weak subjects especially among rural pupils (Alana Azuan, 2003). Therefore, children need to be nurtured at an early age to master their basic Mathematics skills to overcome the problem. Habibah Binti Suib (2004) in her study identified four factors influencing pupils' achievement in Mathematics. The four factors were self motivation, awareness of the importance of Mathematics, parents' attitude and teachers' teaching approaches.

One of the measures taken by Teachers Education Institute to reduce the above problems since 1994 is organizing Mathematics Camp for primary school pupils. Mathematics Camp was identified as one of the approaches for academic intervention (Edward et al., 2001; Wiest, 2008) in which pupils enhance their knowledge, skills and results (Branch, 1999; Wiest, 2008) as well as quality outreach experience (Fox et al., 2004). Previous studies reported that Mathematics Camp improved pupils' attitude towards Mathematics (Beer et al., 2008; Ling et al., 2009; Wiest, 2008; Tichebir & Plavchan, 2010), fun in learning Mathematics (Edward et al., 2001; Hall, 2006; Ling et al., 2009), developed social skills (Edward et al., 2001; Beer et al., 2008; Ling et al., 2009; Wiest, 2008), enjoy learning (Beer et al., 2008; Hall, 2006; Ling et al., 2009), motivated to learn (Beer et al., 2008; Ling et al., 2009), appreciated Mathematics (Beer et al., 2008), improved study skills and Mathematics skills (Beer et al., 2008;

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A Series of Mathematics Camps had been conducted since 2008 for primary pupils based on the new model. These Camps were fully sponsored by the Education Service Bureau, Sarawak Islamic Council. The program was initiated by the Education Service Bureau, Sarawak Islamic Council and planned by experienced Mathematics lecturers. The program for the following Mathematics Camps is the refinement from the Mathematics Camps conducted based on data collected from participants, Mathematics teachers and parents. The first Mathematics Camp was held on June 13-15 2008. The Camp was conducted by two key facilitators assisted by ten assistant facilitators. The assistant facilitators were trainees from a Teacher Education Institute majoring in Mathematics. There were three Mathematics Camps conducted in different divisions in Sarawak in 2008 (Kuching, Mukah, Kota Samarahan and Sri Aman). For the Mukah and Kota Samarahan Camps, only three assistant facilitators were involved. School teachers who accompanied their pupils to the Camp were involved as assistant facilitators. To date, four Mathematics Camps were conducted in year 2008, four in year 2009 and another four in year 2010. The model for the Mathematics Camp suggested in this paper was based on the Mathematics Camps conducted from 2008 to 2010.

The objectives of the Mathematics Camp were as follows:

- a) To instil positive attitude towards Mathematics in primary school pupils.
- b) To promote fun learning in Mathematics.
- c) To motivate pupils in learning Mathematics.
- d) To inculcate pupils' interest in learning Mathematics.
- e) To enhance problem solving skills.
- f) To develop interpersonal skills.
- g) To develop study skills.
- h) To promote enthusiasm in learning Mathematics.
- i) To consolidate basic Mathematical skills.

2. The Mathematics Camp

The Mathematics Camp only involved pupils from primary six. The Camp was designed for three days and two nights during the weekend. The rationale for choosing this duration was based on a few factors such as pupils and facilitators' time schedule, location and the running cost. Malaysian education system is based on five school days per week. Pupils are busy with their studies and homework during weekdays. The only time available is their weekend. On the other hand, the facilitators are experienced Mathematics teachers or lecturers. They need to carry out their duties as educators during weekdays and are only available during weekends. The Mathematics Camp also involved participants' parents on the last day. Most of the activities were done in groups. The activities were interesting recreational Mathematics and related to pupils daily life. Prizes were given away to winners during each activity to encourage the involvement of participants. A parallel session (problem solving course) was organized for Mathematics teachers who accompany their pupils to the Camp. The contents of the course include problem solving models and various techniques of problem solving such as diagrams, tables and finding sub goals.

2.1 Camp Schedule

The Camp spanned over three days and two nights. On the first day, the registration started at 2.45pm. This was followed by a briefing to the participants and singing Mathematics songs. There were two sessions conducted on the first afternoon. The first session was ice-breaking and the second session was recreational Mathematics (Paper Engineering). In the evening, the Mathematics problem solving course was conducted.

On the second day, the participants started off with a morning exercise. After breakfast, two activities were carried out: Mathematics trail and recreational Mathematics (mathematical games). The afternoon session commenced with reflection and the singing of Mathematics song. This was followed by a Mathematics seminar on *Ujian Pencapaian Sekolah Rendah* (UPSR) which focused on study skills and answering techniques. Recreational Mathematics (Mathematics challenge / assorted Mathematics puzzles / Mathemagic) was carried out after the tea break. The second day ended with Mathematics quiz in the evening.

The pupils had some morning exercises to “jumpstart” the program on the third day. After breakfast, two activities were held concurrently: motivational talk for participants and a parenting talk for participants’ parents. After the tea break, hand-in-hand activity involved parents and their child was conducted. The Mathematics Camp ended with prize-giving and a closing ceremony. The camp came to an end at 2.00pm.

2.2 Activity

The philosophy of Mathematics Camp conducted by Edward et al. (2001) was based on six guided principles: A sense of family, high standard and expectations, math, math, math!, challenging rather than remedial content, students teaching students and learning in groups (p.413).

Various indoor and outdoor activities also suggested in the literature for Mathematics Camps such as problem solving, reasoning, recreational, social activities (Wiest, 2008), games and stations (Tichenor & Plavchan, 2010). According to Cooper et al. (2006), these activities helped students to built pride, confidence and self worth and challenge them to perform. Parents’ involvement was also suggested for the camp (Wiest, 2008). This would help students feel the sense of family in the camp (Edward et al. 2001). Cooper et al. (2006) reported that through this type of activity, students were motivated and supported by their family.

The activities organized in the Mathematics Camps were guided by the philosophy of Mathematics Camps used by Edward et al. (2001) and activities suggested in the literature (Edward et al., 2001; Wiest, 2008). The activities were as follows:

a) Singing Mathematics songs

This activity was conducted in between activities and at the beginning of the activities. The main aim was to promote fun learning in Mathematics. When pupils sing the Mathematics songs with actions, they were actively involved physically, mentally and emotionally. This activity invariably attracted participants’ attention in the Mathematics Camp activities.

b) Ice breaking

The main aim of ice-breaking activities was to give opportunities for pupils from different schools to know their peers. This activity also helps to improve pupils’ interpersonal skills.

c) Recreational Mathematics

Various recreational Mathematics activities were conducted. These activities included paper engineering, Mathematics challenges, Mathematics trail, mathemagic and assorted Mathematics puzzles. They activated pupils’ curious minds, not only helping to stimulate pupils’ minds but also improved pupils’ interest and confidence in Mathematics. These activities integrated mathematical concepts and skills whereby pupils apply mathematical concepts learned in school. These learning processes indirectly consolidate pupils’ basic Mathematics skills. Furthermore, they also promote interpersonal skills through collaborative activities.

d) Mathematics problem solving

Pupils were refreshed on the techniques of solving mathematical problems. Problem solving strategies such as draw a diagram, table and finding sub goals were introduced. These activities encouraged pupils to discuss the problem solving processes and make critical reflection on the solutions obtained and methods used. Through discussions, pupils may improve their understanding and gain better insights into the problem. Pupils were given opportunity to communicate their ideas through group discussions and presentations.

e) Mathematics trail

Mathematics trail is an outdoor activity where each group of pupils work together to solve real-life mathematical problems while they move in groups from station to station. Two criteria were used to determine the winner. The first criterion was time taken to complete all the assigned tasks. The second criterion was the solutions to Mathematical problems assigned in each station. This activity provides an opportunity for pupils to work in a team and to promote team spirit among pupils.

f) Quiz Mathematics

Individual and group quizzes were conducted in this activity. Small tokens were prepared for winners to encourage pupils participation and to make the activity more competitive and exciting. The quiz questions were based on primary school Mathematics curriculum specifications to test pupils' basic Mathematics skills and general knowledge.

g) Reflection session

This session provided an opportunity for participants to reflect upon the activities they had attended in the Mathematics Camp. The participants had to reflect based on their experiences, feelings and benefits from the camp activities. They were encouraged to share their experiences with their peers who do not have chance to attend the Mathematics Camp. This would promote the value of sharing and at the same time allow them to practice what they have learned in the Camp to consolidate their skills.

h) Motivational talk

This session aimed to motivate pupils and encourage them to appreciate Mathematics. A motivator was invited to conduct this session.

i) Parenting talk

This was a special session for participants' parents who were encouraged to guide their children and give full moral support to their children in their learning process. An invited speaker specializing in parenting conducted this session.

j) Hand-in-hand activity

This hand-in-hand activity was specially designed for parents and their children. Participants had to invite their parents to take part in the Mathematics activities. This activity aimed not only to foster closer relationship between parents and their child but also enable them to guide their children learning Mathematics.

2.3 Training of the trainers

To extend the Mathematics Camp simultaneously at different locations, training of the trainer began in 2009. Twenty retired Mathematics teachers were trained based on the modules written specifically for the Mathematics Camp. Upon completing the training, they were given an opportunity to conduct the Mathematics Camp with their trainers. This group of facilitators were then given the chance to conduct the Mathematics Camp in the following Camp. A post mortem session was conducted and feedback obtained from the main trainers and facilitators were used as a guide to improve their facilitating skills. In the meeting, new Mathematics activities were also introduced and discussed among the facilitators. The model for training of the trainer is shown in figure 1.

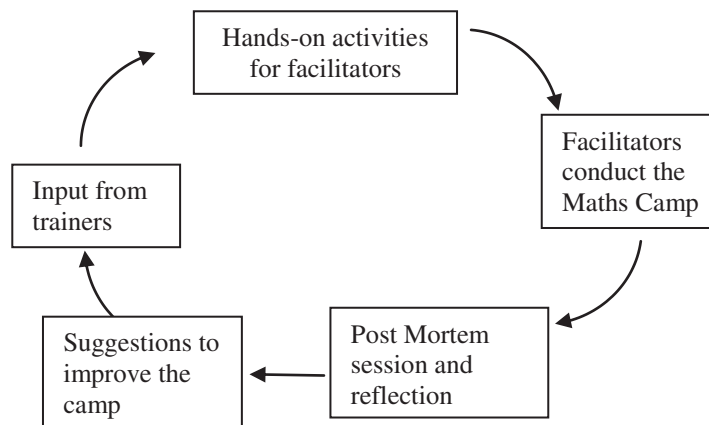


Figure 1: Model for training of the trainers

2.4 Venue

The first Mathematics Camp was conducted at a Teacher Education Institute. The second and third Camp were conducted at Mukah Youth Centre and a primary school respectively. Starting from fourth Mathematics Camp, the venue was fixed at the local mosque.

2.5 *The Comparison between previous Mathematics Camp (1994-2007) and current Mathematics Camp (2008-2010)*

Table 1 shows the difference between the previous model and the current model for the Mathematics Camp. Generally, the current model reduces administrative time such as asking for permission to use certain venues, selection of pupils and permission for teachers to participate as facilitators. In the current model, the main organizing committees were full-time officers in their organization where they can carry out their duties during weekdays. The availability of the free venue reduces the running cost of the Mathematics Camp. The retired teachers (facilitators) are always available for the Mathematics Camp and they are able to do the planning during weekdays. This will reduce the burden of school teachers who need to teach during weekdays and conduct the Mathematics Camp during weekends.

Table 1 The comparison between previous Mathematics Camp (1994 – 2007) and current Mathematics Camp (2008 -2010)

No.		Previous Mathematics Camp (1994 – 2007)	Current Mathematics Camp (2008 –2010)
1.	Venue	Teacher Education Institute or Hotel	Local Mosque
2.	Organization	Staff from Teacher Education Institute as the main organizing committee with collaboration from Sarawak Education Department and school teachers.	Staff from Education Service Bureau, Sarawak Islamic Council assisted by committee from local mosque, Teacher Education Institute and Sarawak Education Department. Committee from the local mosque will assist the Education Service Bureau in transportation, food and beverages, preparation of rooms or hall and equipment use during the Mathematics Camp, registration and closing ceremony.
3.	Funding	Government agencies such as The Sarawak Foundation, National Unit Trust Limited, Council for Social Development and Urbanization	Education Service Bureau, Sarawak Islamic Council.
4.	Facilitators	Staff from Teacher Education Institute with the collaboration from school teachers.	Retired school teachers with the collaboration from school teachers and guided by lecturers from a Teacher Education Institute and university

3. Methodology

The explanatory design of mixed method was used in each Mathematics Camp conducted. The population of the study were pupils who attended the twelve Mathematics Camps. Census was used in the study. The instrument used in the quantitative study was questionnaire modified from Alken Revised Mathematics Attitude Scale (ARMAS) which was developed by Aiken and Dreger (1961) and amended by Aiken (1963). The instrument consisted of 20 items with five likert scale (1-Strongly disagreed and 5- strongly agreed). The total score from 20 to less than 60 indicates negative attitude towards Mathematics, 60 means neutral and more than 60 shows positive attitude towards Mathematics. ARMAS instrument for pretest was administered at the first session of the Camp and the posttest was administered at the last session. Perception questionnaire (Ling et al., 2009) was distributed and collected at the last session of the Mathematics Camp. Pupils were also asked to rank the Camp activities according to their preference. The qualitative study involved randomly selected pupils, parents and school teachers who accompany their pupils in each Camp. A structured interview questions were used for the interview. The interview session was conducted at the last day of the Camp. The quantitative data was analyzed using SPSS software whilst the qualitative data was coded using NVivo software. Descriptive statistics were used to descript the quantitative data collected.

4. Results and discussions

There were 1454 respondents completed the attitude towards Mathematics questionnaire and perception questionnaire. 50 pupils, 36 parents and 24 teachers were selected randomly for the interview.

4.1 Attitude towards Mathematics

The pre-test showed that 35.2% of the respondents had negative attitude towards Mathematics, 11.6% of the respondents had neutral attitude towards Mathematics and 53.2% of them had positive attitude towards Mathematics (Table 2). This indicated that most of participants had positive attitude towards Mathematics with the mean total score was 68.61 (Table 4).

Table 2 Pre-test for attitude towards Mathematics

Attitude towards Mathematics	Frequency	Percent
Negative attitude	512	35.2
Neutral	168	11.6
Positive attitude	774	53.2
Total	1454	100.0

Participants had shown improvement in attitude towards Mathematics at the end of the Mathematics Camps. The percentage of participants shown negative attitude towards Mathematics decreased from 35.2% to 15.5%. The percentage of participants with positive attitude towards Mathematics increased from 53.2% to 88.5%. None of them had neutral attitude towards Mathematics (Table 3). Mean total score for post-test was 84.47 (Table 3). Overall, participants showed positive attitude towards Mathematics in the posttest compared to the pretest. This finding was consistent with Beer et al. (2008), Wiest (2008) and Tichebir and Plavchan (2010).

Table 3 Post-test for attitude towards Mathematics

Attitude towards Mathematics	Frequency	Percent
Negative attitude	167	11.5
Neutral	0	0.0
Positive attitude	118	88.5
Total	1454	100.0

Table 4 Mean total score for attitude towards Mathematics

	Pre-test	Post-test
Mean	68.61	84.47

4.2 Perception on Mathematics Camp

There were seven statements measured perception of participants toward Mathematic Camp. For the first statement 'Mathematics Camp activities were very interesting and enjoyable', 73.2% of the participants were strongly agreed, 23.1% of them were agreed, 2.9% of them were not sure and 0.8% of them were disagreed. None of them strongly disagreed with this statement. The second statement was 'Mathematics Camp activities attracted my interest towards Mathematics'. There were 67.8% of the participants strongly agreed, 26.0% of them were agreed, 6.2% of them were not sure and none of them disagreed or strongly disagreed with this statement. The third statement was 'Mathematics Camp activities motivated me to learn Mathematics'. Among the respondents, 57.2% of them were strongly agreed, 39.4% of them were agreed and 3.1% of them were not sure. None of them neither disagreed nor strongly disagreed with this statement. The following statement was 'I am actively involved in the Mathematics Camp activities'. 46.5% of the respondents were strongly agreed with this statement, 49.0% of the respondents

were agreed and 4.5% of them were not sure. None of the respondents disagreed nor strongly disagreed with this statement. For the statement ‘I like to cooperate with my peer in group activities’, there were 51.3% of the respondents were strongly agreed, 40.1% of the respondents were agreed, 5.7% of them were not sure, 2.9% of them were disagreed and none of them strongly disagreed. Overall, there were 67.1% of the respondents strongly agreed and 30.9% of them were agreed. There were also 1.7% of the respondents were not sure. There were only 0.3% of the respondents disagreed and none of them strongly disagreed with this statement. Table 5 shows the summary of the seven statements.

Table 5 Students’ Perception on Mathematics Camp

No	Statement	Percentage (%)				
		Strongly disagreed	Disagreed	Not sure	Agreed	Strongly agreed
1.	Mathematics Camp activities were very interesting and enjoyable.	0.0	0.8	2.9	23.1	73.2
2.	Mathematics Camp activities attracted my interest towards Mathematics.	0.0	0.0	6.2	26.0	67.8
3.	Mathematics Camp activities motivated me to learn Mathematics.	0.0	0.0	3.1	39.4	57.2
4.	I am actively involved in the Mathematics Camp activities.	0.0	0.0	4.5	49.0	46.5
5.	I like to cooperate with my peers in group activities.	0.0	2.9	5.7	40.1	51.3
6.	Overall, I am satisfied with the Mathematics Camp activities.	0.0	0.3	1.7	30.9	67.1

Overall, qualitative data showed a positive attitude towards Mathematics in the post-test compared to the pre-test. This finding was consistent with Beer et al. (2008), Wiest (2008) and Tichebir and Plavchan (2010). Participants also perceived that the Mathematics Camp activities were interesting and enjoyable and stimulated their interest in Mathematics. They also agreed that the Mathematics Camp activities motivated them to learn Mathematics. Participants agreed that they were actively involved in the activities and gave full cooperation to their team members in group activities. These few findings were consistent with those of Beer et al. (2008), Edward et al. (2001) and Hall (2006). Overall, the participants were satisfied with the Mathematics Camp.

The participants were also asked to rank the activities to indicate their preference. Overall, the ranking from the highest to the lowest were Mathematics quiz, ice-breaking, assorted Mathematics puzzles, Mathematics games, Mathematics trial and paper engineering.

Teachers which accompanied their pupils to the Mathematics Camp perceived that the Mathematics Camp provided opportunities for their pupils to take up various challenges. They revealed that their pupils enjoyed the activities, motivated to learn and enthusiastic in learning Mathematics. All teachers consensually agreed that the Mathematics Camp benefit their pupils by providing them opportunities to take part in various challenging and interesting activities. Teachers’ perceptions were consistent with Hall (2006), Cooper et al. (2006), Tichenor and Plavchan (2010) and Weist (2008). Teachers’ perceptions were also consistent with their pupils’ perception.

The parents perceived that they learned how to guide and support their children in learning Mathematics. As mentioned by Habibah Binti Suib (2004), parents’ attitude was one of the factors influencing pupils’ achievement in Mathematics. With the parents’ guidance and support, it is hope that their children will perform better in Mathematics. The parents also revealed that their children enjoyed themselves when doing Mathematics activities together with them. They said that the Mathematics Camp helped to build up their children interest in Mathematics and motivate them to learn Mathematics. Their opinions echoed those of Beer et al. (2008), Edward et al. (2001) and Hall (2006). They also cited that their children were more confidence and they hoped that the school teachers and parents would continue to motivate them while in school or at home. For the parents, the Mathematics Camp was very successful and meaningful. They hoped that the organiser would continue to organize more Mathematics Camp in future so that more pupils would have the opportunity to attend the Camp.

5. Conclusion

The series of Mathematics Camps were successfully conducted and the outcome proved most rewarding. The series of Mathematics Camps have achieved their objectives which aimed to promote a positive attitude towards Mathematics and motivate pupils in learning Mathematics. With the right attitude towards mathematics, pupils will not only enjoy learning Mathematics, mathematical problem solving but also develop interpersonal and study skills as well as consolidate their basic Mathematical skills. The feedback from participants, teachers and parents were very encouraging and motivating to the organizing committee in conducting more of such activities in future.

References

- Azlina Azuan. (2003). *Keyakinan Guru-Guru Program Pensiswazahan Kursus Perguruan Lepas Diploma, Pengajar Sains Tulen dan Matematik Tambahan dalam Bahasa Inggeris*, Universiti Teknologi Malaysia, Johore.
- Beer, G., Le Blanc, M., & Miller, M. J. (2008). Summer Learning Camps: Helping Pupils to Prepare for College. *College Pupil Journal*, 42(3), 930-938.
- Branch, A. (1999). Math Camp Helps Increase Pupils' Scores in Arkansas. *Curriculum Administrator*, 35(12), 15.
- Edwards, T., Kahn, S., & Brenton, L. (2001). Math Corps Summer Camp: An Inner City Intervention Program. *Journal of Education for Pupils Placed at Risk*, 6(4), 411.
- Fox, R., Newell, G., & Frank, C. (2004). *Experiences Hosting High School Summer Camps to Promote University Outreach*. Paper presented at the 2nd annual conference on Mid-south college computing, Little Rock, Arkansas.
- Habibah Binti Suib. (2004). Faktor-faktor Kelemahan Pelajar dalam Mata Pelajaran Matematik di Peringkat Sekolah Rendah, *Education faculty*. Sekudai: Universiti Teknologi Malaysia.
- Hall, P. (2006). Working with year 6. *Mathematics Teaching Incorporating Micromath*, 196, 28-29.
- Helen, H. H. (2008). A Summer Programming Workshop for Middle School Girls. *Consortium for Computing Sciences in Colleges*, 23(6), 194-202.
- Ling, S. E., Lai, K. L., & Ling, S. C. (2009, 10-11 June 2009). *The Effect of Mathematics Camp: Stake Holders Perception and Pupils Attitude towards Mathematics*. Paper presented at the International conference on educational research and practice (ICERP) 2009, Putrajaya, Malaysia.
- Tichenor, M., & Plavchan, J. (2010). Summer Camps: A Fun Way to Reinforce Math Skills. *Journal of Instructional Psychology*, 37(1), 71-75.
- Wiest, L. (2008). Conducting a Mathematics Camp for Girls and Other Mathematics Enthusiasts. *Australian Mathematics Teacher*, 64(4), 17-24.